

CLAIMS

1. A dielectric barrier discharge excimer light source, comprising:

an anode having a dielectric body and an anode electrode covered with said dielectric body and composed of a straight elongated hollow cylindrical body; and

an elongated cathode surrounding said anode, said cathode comprising a straight semicylindrical body and a cathode wire group composed of a plurality of wires fixed parallel to each other to said semicylindrical body,

wherein said anode and said cathode are disposed parallel to each other in the longitudinal direction, and

wherein said cathode has formed on the surface of said cathode at the side facing said anode a reflective surface for reflecting the radiation in a vacuum ultraviolet spectral region.

2. The dielectric barrier discharge excimer light source according to claim 1,

wherein a plurality of said wires constituting said cathode wire group are stretched between the two ends of said straight semicylindrical body extending along the longitudinal direction thereof;

wherein the diameter of a plurality of said wires constituting said cathode wire group does not exceed 2 mm; and

wherein the angle formed by the longitudinal direction of said straight semicylindrical body and the longitudinal direction of said wires is set to a right angle or to an angle within a range such that an angle shift from the perpendicular position does not exceed 15°.

3. A dielectric barrier discharge excimer light source, comprising:

an anode having a dielectric body and an anode electrode covered with said dielectric body and composed of a straight elongated hollow cylindrical body; and

an elongated cathode surrounding said anode, said cathode comprising a straight semitubular body composed of three surfaces and having a U-shaped cross section perpendicular to the longitudinal direction and a cathode wire group composed of a plurality of wires fixed parallel to each other to said semitubular body,

wherein said anode and said cathode are disposed parallel to each other in the longitudinal direction, and

wherein said cathode has formed on the surface of said cathode at the side facing said anode a reflective surface for reflecting the radiation in a vacuum ultraviolet spectral region.

4. The dielectric barrier discharge excimer light source according to claim 3,

wherein a plurality of said wires constituting said cathode wire group are stretched between the two ends of said straight semitubular body extending along the longitudinal direction thereof;

wherein the diameter of a plurality of said wires constituting said cathode wire group does not exceed 2 mm; and

wherein the angle formed by the longitudinal direction of said straight semitubular body and the longitudinal direction of said wires is set to a right angle or to an angle within a range such that an angle shift from the perpendicular position does not exceed 15°.

5. A dielectric barrier discharge excimer light source, comprising:

5 an anode having a dielectric body and an anode electrode covered with said dielectric body and composed of an elongated hollow tubular body composed of four surfaces and having a rectangular cross section perpendicular to the longitudinal direction; and

an elongated cathode surrounding said anode, said cathode comprising a straight semitubular body composed of three surfaces and having a U-shaped cross section perpendicular to the
10 longitudinal direction and a cathode wire group composed of a plurality of wires fixed parallel to each other to said semitubular body,

wherein said anode and said cathode are disposed parallel to each other in the longitudinal direction, and

wherein said cathode has formed on the surface of said cathode at the side facing said anode a
15 reflective surface for reflecting the radiation in a vacuum ultraviolet spectral region.

6 The dielectric barrier discharge excimer light source according to claim 5,

wherein a plurality of said wires constituting said cathode wire group are stretched between the two ends of said straight semitubular body extending along the longitudinal direction thereof;

wherein the diameter of a plurality of said wires constituting said cathode wire group does not
20 exceed 2 mm; and

wherein the angle formed by the longitudinal direction of said straight semitubular body and the longitudinal direction of said wires is set to a right angle or to an angle within a range such that an angle shift from the perpendicular position does not exceed 15°.

7. A dielectric barrier discharge excimer light source, comprising:

25 an anode group composed of a plurality of anodes having a dielectric body and an anode electrode covered with said dielectric body and composed of a straight elongated hollow cylindrical body;

the anodes being disposed in a row so as to be parallel to said straight elongated cylindrical body; and

30 an elongated cathode surrounding said anode, said cathode comprising a cathode wire group composed of a plurality of wires fixed parallel to each other to a straight semitubular body composed of three surfaces and having a U-shaped cross section perpendicular to the longitudinal direction,

wherein said anode and said cathode are disposed parallel to each other in the longitudinal direction, and

wherein said cathode has formed on the surface of said cathode at the side facing said anode a reflective surface for reflecting the radiation in a vacuum ultraviolet spectral region.

8. The dielectric barrier discharge excimer light source according to claim 7,

wherein a plurality of said wires constituting said cathode wire group are stretched between the two ends of said straight semitubular body extending along the longitudinal direction thereof;

wherein the diameter of a plurality of said wires constituting said cathode wire group does not exceed 2 mm; and

wherein the angle formed by the longitudinal direction of said straight semitubular body and the longitudinal direction of said wires is set to a right angle or to an angle within a range such that an angle shift from the perpendicular position does not exceed 15°.

9. A dielectric barrier discharge excimer light source, comprising:

an anode group composed of a plurality of anodes having a dielectric body and an anode electrode covered with said dielectric body and composed of an elongated hollow tubular body composed of four surfaces and having a rectangular cross section perpendicular to the longitudinal direction;

the anodes being disposed in a row so as to be parallel to said straight elongated tubular body; and

an elongated cathode surrounding said anode, said cathode comprising a cathode wire group composed of a plurality of wires fixed parallel to each other to a straight semitubular body composed of three surfaces and having a rectangular cross section perpendicular to the longitudinal direction,

wherein said anode and said cathode are disposed parallel to each other in the longitudinal direction, and

wherein said cathode formed on the surface of said cathode at the side facing said anode a reflective surface for reflecting the radiation in a vacuum ultraviolet spectral region.

10. The dielectric barrier discharge excimer light source according to claim 9,

wherein a plurality of said wires constituting said cathode wire group are stretched between the two ends of said straight semitubular body extending along the longitudinal direction thereof;

wherein the diameter of a plurality of said wires constituting said cathode wire group does not exceed 2 mm; and

wherein the angle formed by the longitudinal direction of said straight semitubular body and the longitudinal direction of said wires is set to a right angle or to an angle within a range such that an angle shift from the perpendicular position does not exceed 15°.

11. A dielectric barrier discharge excimer light source, comprising :

a discharge electrode unit group having disposed therein discharge electrode units in a row parallel to each other in the longitudinal direction, said discharge electrode unit comprising

an anode having a dielectric body and an anode electrode covered with said dielectric body and composed of a straight elongated hollow cylindrical body, and

an elongated cathode surrounding said anode, said cathode comprising a straight semicylindrical body and a cathode wire group composed of a plurality of wires fixed parallel to each other to said semicylindrical body,

wherein a reflective surface for reflecting the radiation in a vacuum ultraviolet spectral region is formed on the surface of said cathode at the side facing said anode.

12. The dielectric barrier discharge excimer light source according to claim 11, wherein a plurality of said wires constituting said cathode wire group are stretched between the two ends of said straight semicylindrical body extending along the longitudinal direction thereof; wherein the diameter of a plurality of said wires constituting said cathode wire group does not exceed 2 mm; and

wherein the angle formed by the longitudinal direction of said straight semicylindrical body and the longitudinal direction of said wires is set to a right angle or to an angle within a range such that an angle shift from the perpendicular position does not exceed 15°.

13. A dielectric barrier discharge excimer light source, comprising: a discharge electrode unit group having disposed therein discharge electrode units in a row parallel to each other in the longitudinal direction, said discharge electrode unit comprising an anode having a dielectric body and an anode electrode covered with said dielectric body and composed of a straight elongated hollow cylindrical body, and

an elongated cathode surrounding said anode, said discharge electrode units comprising a straight semitubular body composed of three surfaces and having a U-shaped cross section perpendicular to the longitudinal direction and a cathode wire group composed of a plurality of wires fixed parallel to each other to said semitubular body,

wherein said cathode has formed on the surface of said cathode at the side facing said anode a reflective surface for reflecting the radiation in a vacuum ultraviolet spectral region.

14. The dielectric barrier discharge excimer light source according to claim 13, wherein a plurality of said wires constituting said cathode wire group are stretched between the two ends of said straight semitubular body extending along the longitudinal direction thereof; wherein the diameter of a plurality of said wires constituting said cathode wire group does not exceed 2 mm; and

wherein the angle formed by the longitudinal direction of said straight semitubular body and the longitudinal direction of said wires is set to a right angle or to an angle within a range such that an angle shift from the perpendicular position does not exceed 15°.

15. A dielectric barrier discharge excimer light source, comprising:

a discharge electrode unit group having disposed therein discharge electrode units in a row parallel to each other in the longitudinal direction, said discharge electrode unit comprising an anode having a dielectric body and an anode electrode covered with said dielectric body and composed of an elongated hollow tubular body, said tubular body being composed of four surfaces and having a rectangular cross section perpendicular to the longitudinal direction, and
5 an elongated cathode surrounding said anode, said cathode comprising a straight semitubular body composed of three surfaces and having a U-shaped cross section perpendicular to the longitudinal direction and a cathode wire group composed of a plurality of wires fixed parallel to each other to said semitubular body,

10 wherein said cathode has formed on the surface of said cathode at the side facing said anode a reflective surface for reflecting the radiation in a vacuum ultraviolet spectral region.

16. The dielectric barrier discharge excimer light source according to claim 15, wherein a plurality of said wires constituting said cathode wire group are stretched between the two ends of said straight semitubular body extending along the longitudinal direction thereof;

15 wherein the diameter of a plurality of said wires constituting said cathode wire group does not exceed 2 mm; and

wherein the angle formed by the longitudinal direction of said straight semitubular body and the longitudinal direction of said wires is set to a right angle or to an angle within a range such that an angle shift from the perpendicular position does not exceed 15°.

20 17. The dielectric barrier discharge excimer light source according to any one of claims 7 to 10, wherein said cathode is composed of a plurality of straight rod-like auxiliary conductors, said auxiliary conductors being parallel to the longitudinal direction of said semitubular body and being disposed in a row in the same plane between said anode group and said cathode wire group.

25 18. The dielectric barrier discharge excimer light source according to any one of claims 1 to 4, 7, 8, and 11 to 14, wherein said anode electrode has a semicylindrical shape, the convex surface of said semicylindrical shape being disposed in the direction where said cathode wire group is disposed, and the ends along the longitudinal direction of said semicylindrical shape having the shape rounded toward the inside of said semicylindrical shape.

30 19. The dielectric barrier discharge excimer light source according to any one of claims 5, 6, 9, 10, and 15, wherein said anode electrode has a semitubular rectangular shape, the bottom surface of said semitubular rectangular shape being disposed in the direction where said cathode wire group is disposed, and the ends along the longitudinal direction of said semitubular rectangular shape having the shape rounded toward the inside of said rectangular shape.

20. A dielectric barrier discharge excimer light source, comprising:

an anode having a dielectric body and an anode electrode covered with said dielectric body and composed of a straight elongated hollow cylindrical body; and

a metallic cathode wire in the form of a spirally shaped body,

wherein said cathode wire is disposed so as to surround said anode, the central axis of said spirally shaped body coinciding with the central axis of said cylindrical body.

21. A dielectric barrier discharge excimer light source comprising:

an anode having a dielectric body and an anode electrode covered with said dielectric body and composed of a straight elongated hollow cylindrical body; and

a metallic cathode wire in the form of a spirally shaped body,

wherein a coaxial discharge electrode unit is disposed inside a reflector, said coaxial discharge electrode unit being constructed such that said cathode wire is disposed so as to surround said anode, the central axis of the spirally shaped body coinciding with the central axis of said cylindrical body, and

wherein said reflector is a straight elongated semicylindrical body, the longitudinal direction of said semicylindrical body, the central axis of said cylindrical body, and the central axis of said spirally shaped body being disposed parallel to each other.

22. A dielectric barrier discharge excimer light source comprising:

an anode having a dielectric body and an anode electrode covered with said dielectric body and composed of a straight elongated hollow cylindrical body; and

a metallic cathode wire in the form of a spirally shaped body,

wherein a coaxial discharge electrode unit is disposed inside a single reflector, said coaxial discharge electrode unit being constructed such that said cathode wire is disposed so as to surround said anode, the central axis of the spirally shaped body coinciding with the central axis of said cylindrical body, and central axes thereof being parallel to each other in said reflector, and

wherein said reflector is a semitubular body composed of three surfaces and having a U-shaped cross section perpendicular to the longitudinal direction.

23. The dielectric barrier discharge excimer light source of any one of claims 20 to 22, wherein said anode electrode has a semicylindrical shape, the ends along the longitudinal direction of said semicylindrical shape having the shape rounded toward the inside of said semicylindrical shape.

24. A dielectric barrier discharge excimer light source, comprising:

an anode having a dielectric body and an anode electrode covered with said dielectric body and composed of a straight elongated hollow cylindrical body; and

a metallic cathode wire in the form of a spirally shaped body,

wherein said cathode wire is disposed so as to surround said anode, the central axis of the spirally shaped body coinciding with the central axis of said cylindrical body,

wherein said cathode wire and said anode are disposed inside a tube fabricated from a dielectric material which is transparent with respect to the wavelength of the emitted light, and

5 wherein said cathode wire and said anode are sealed with said tube fabricated from a dielectric material which is transparent with respect to the wavelength of the emitted light.

25. The dielectric barrier discharge excimer light source according to any one claim of claims 1 to 24, wherein a liquid or gas for cooling can circulate inside the casing of the anode.

10 26. The dielectric barrier discharge excimer light source according to any one claim of claims 20 to 25, wherein the diameter of said cathode wire of a spiral shape does not exceed 2 mm.

27. The dielectric barrier discharge excimer light source according to any one of claims 1 to 26, wherein the distance between said anode and said cathode is 2 mm.

28. The dielectric barrier discharge excimer light source according to any one of claims 1 to 26, wherein said anode and said cathode are in contact with each other.